

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR REACTOR REGULATION  
WASHINGTON, D.C. 20555

April 27, 1989

NRC INFORMATION NOTICE NO. 89-44: HYDROGEN STORAGE ON THE ROOF OF THE  
CONTROL ROOM

Addressees:

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose:

This information notice is provided to alert recipients to potential generic problems pertaining to the storage of hydrogen in the vicinity of safety-related structures and air pathways into safety-related structures. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

During the Region V Chemistry Team Inspection at the Trojan Nuclear Plant the week of April 17, 1989, the inspectors identified a potential safety problem concerning the location of the hydrogen storage facility. Hydrogen is used on pressurized water reactor (PWR) plants for (1) providing a cover gas in the volume control tank, and (2) for cooling the main turbine generator. At boiling water reactor (BWR) plants, hydrogen is also used for cooling the main turbine generator and for injection into the feed system for plants which have implemented hydrogen water chemistry. The Trojan hydrogen storage facility is located on the control room roof which is 30-inch-thick reinforced concrete. The following potential safety problems were identified during the Region V Chemistry Team Inspection:

1. Leakage of hydrogen gas from the storage facility in proximity to the air intakes to the control room ventilation and emergency pressurization system may introduce a flammable or explosive gas mixture into the control room. Because the hydrogen storage facility, containing four 8,000-scf hydrogen tanks at up to 2450 psig, is Seismic Category II, a seismic event may result in a hydrogen leak. Furthermore, the pressure relief valves in the hydrogen facility exhaust downward to within 6 inches of the control room roof in the vicinity of the control room ventilation system air intakes. It was also noted that six 8,000-scf nitrogen tanks were located

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in the vicinity of the control room air intakes. Nitrogen leakage and dispersion into the air intakes may lead to incapacitation of the control room operators.

2. A detonation of a hydrogen storage tank (energy equivalent to 217 pounds of TNT) may structurally damage and affect performance of safety-related equipment on the control room roof such as the ventilation system intake and exhaust structure, the emergency pressurization system, and equipment in the control room itself.
3. An explosion of the hydrogen delivery truck that provides hydrogen to the facility through a fill line located at ground level on the wall of the auxiliary building may structurally damage safety-related component cooling water pumps and radwaste storage tanks located inside the auxiliary building and in the vicinity of the hydrogen fill line.

#### Discussion:

- The topical report "Guidelines for Permanent BWR Hydrogen Water Chemistry Installations," 1987 Revision, EPRI NP-5283-SR-A was reviewed and accepted by NRC. NRC's approval letter, dated July 13, 1987, states that this topical report may be useful in providing industry guidance for the design, operation, maintenance, surveillance, and testing of hydrogen systems for (1) providing a cover gas in the PWR volume control tank and (2) for cooling the main turbine generator. In addition, NRC Information Notice No. 87-20, "Hydrogen Leak In Auxiliary Building," dated April 20, 1987, indicated that the NRC was then reviewing the EPRI/BWROG topical report (EPRI NP-5283-SR-A). The Trojan plant hydrogen facility does not meet these guidelines from the standpoint of (1) the separation distance needed between a hydrogen pipe break and the control room ventilation intake to prevent buildup of a flammable or explosive gas mixture inside the control room, and (2) the separation distance needed to prevent damage to safety-related structures resulting from the explosion of an 8,000-scf hydrogen tank.

#### Related Generic Communications:

NRC Information Notice No. 87-20, "Hydrogen Leak In Auxiliary Building," dated April 20, 1987, discusses leakage of hydrogen from a volume control tank globe valve in the auxiliary building.

NUREG/CR-3551, ORNL/NOAC-214 "Safety Implications Associated With In-Plant Pressurized Gas Storage and Distribution Systems in Nuclear Power Plants," dated May 1985, provides information useful in considering hazards and methods to ensure the safe handling of pressurized gases, including hydrogen.

EPRI NP-5283-SR-A, "Guidelines For Permanent BWR Hydrogen Water Chemistry Installations" - 1987 Revision, dated September 1987, is a topical report approved by the NRC that provides industry guidance for the design, operation, maintenance, surveillance, and testing of hydrogen systems. It was also recommended by the NRC for use on hydrogen systems for (1) providing a cover gas in the PWR volume control tank, and (2) for cooling the main turbine generator.

No specific action or written response is required by this information notice. If you have any questions about this matter, please contact the technical contact listed below or the Regional Administrator of the appropriate regional office.

*Charles E. Rossi*

Charles E. Rossi, Director  
Division of Operational Events Assessment  
Office of Nuclear Reactor Regulation

Technical Contact: Frank J. Witt, NRR  
(301) 492-0823

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED  
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
88-82, Supp. 1	Torus Shells with Corrosion and Degraded Coatings in BWR Containments	5/2/89	All holders of OLs or CPs for BWRs.
89-43	Permanent Deformation of Torque Switch Helical Springs in Limitorque SMA-Type Motor Operators	5/1/89	All holders of OLs or CPs for nuclear power reactors.
88-97, Supp. 1	Potentially Substandard Valve Replacement Parts	4/28/89	All holders of OLs or CPs for nuclear power reactors.
89-42	Failure of Rosemount Models 1153 and 1154 Transmitters	4/21/89	All holders of OLs or CPs for nuclear power reactors.
89-41	Operator Response to Pressurization of Low- Pressure Interfacing Systems	4/20/89	All holders of OLs or CPs for nuclear power reactors.
88-75, Supplement 1	Disabling of Diesel Generator Output Circuit Breakers by Anti-Pump Circuitry	4/17/89	All holders of OLs or CPs for nuclear power reactors.
89-40	Unsatisfactory Operator Test Results and Their Effect on the Requalification Program	4/14/89	All holders of OLs or CPs for nuclear power reactors.
89-39	List of Parties Excluded from Federal Procurement or Non-Procurement Programs	4/5/89	All holders of OLs or CPs for nuclear power reactors.
89-38	Atmospheric Dump Valve Failures at Palo Verde Units 1, 2, and 3	4/5/89	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License  
CP = Construction Permit

Central File

Regional Administrators

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by NRC in 1986 provides acceptance criteria for hydrogen storage. This report is titled "Guidelines for Permanent BWR Hydrogen Water Chemistry Installations" - 1987 Revision, EPRI NP-5283-SR-A, dated September 1987.

Original signed by  
Thomas E. Murley

Thomas E. Murley, Director  
Office of Nuclear Reactor Regulation

Attachment:  
Information Notice No. 89-44, April 27, 1989

cc: T. Murley  
F. Miraglia  
L. Shao  
C. Rossi  
G. Holahan  
J. Richardson  
C. McCracken  
F. Witt

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Regional Administrators

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Thomas E. Murley, Director  
Office of Nuclear Reactor Regulation

Attachment: Information Notice No. 89-XX

cc: F. Miraglia  
L. Shao  
C. Rossi  
G. Holahan  
J. Richardson  
C. McCracken  
F. Witt

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